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ANIMALS OF THE ANCIENTS.

Die Antike Tierwelt. By Otto Keller. Erster Band, Säugetiere. Pp. xii+434. (Leipzig: W. Engelmann, 1909.) Price 10 marks.

FOR many years past the author of this interesting volume has been engaged in investigating the records relating to animals known to the ancients, with the object of identifying the various species described or depicted, and working out their past history and distribution, special attention, in the case of mammals, being directed to the larger and more interesting forms, and those which have been domesticated by man. The results of this protracted study are incorporated in the work, of which the first volume is now before me, and in many respects Dr. Keller is to be congratulated on the outcome of his labours, especially in regard to his treatment of the various species of the Primates and Carnivora, although even among these he does not appear to have made himself acquainted with all the recent literature on the subject, and notably the work of Dr. Lortet on the mummified animals of Egypt, now in course of publication in the Archives of the Lyons Museum.

Even in the case of the Carnivora, I cannot, however, agree with all the author's conclusions, as, for instance, the statement on p. 72 that domesticated cats owe their origin in part to the jungle-cat (*Felis chaus*). Indeed, it is difficult to believe that he is fully acquainted with the characteristics of that species, or he would have hesitated in identifying with it the cat depicted in a fresco from Pompeii, which is reproduced on p. 72, the tail being much too long, and the ears showing no trace of the distinctive tufts.

Leaving the Carnivora with this brief mention, I pass on to the Ungulata, where there is much more room for criticism, more especially in regard to the author's identification of animals represented in the ancient sculptures and cylinders of Syria and adjacent parts of Asia Minor with species indigenous to Central Asia and other distant regions. Nor is this all, for when Dr. Keller attempts to identify animals represented in the frescoes of ancient Egypt with species inhabiting northern Africa, he is, in many cases, to say the least, far from happy in his conclusions. In the upper figure on p. 295 we find, for instance, an antelope identified as a hartebeest (Butalis), although it is much more probably a lesser kudu (*Strepsiceros imberbis*), and is identical with the fresco from the Ptahhetep Chapel, reproduced in Fig. 3 of the present writer's paper on "Some Ancient Animal Portraits" (NATURE, vol. lxx., pp. 207–209, 1904), and provisionally identified with that species. Again, the animals in the lower figure (99) on the page cited are likewise termed Bubalis, although two species are clearly portrayed, one being the presumed lesser kudu, while the other is, I think, the brindled gnu (*Connochaetes taurinus*). Further, on p. 291, Fig. 94, we find a fresco identified with the addra gazelle (*Gazella dama ruficollis*),[1] although it clearly represents *G. soemmerringi*, as does Fig. 2 in my above-cited article. The white oryx (*Oryx leucoryx*), Fig. 95, the addax (*Addax nasomaculatus*), Fig. 97, and the Nubian ibex (*Capra nubiana*), Fig. 101, are, on the other hand, correctly identified.

Leaving animals indigenous to Egypt and the neighbouring countries, attention may be directed to Fig. 93A, which is the one reproduced in NATURE for September 2, 1909, in a review of Countess Cesaresco's "Man and Animals in Human Thought." In that work the animals shown in this Assyrian relief are described as goats, but it was pointed out in the review that they are much more probably gazelles, although I was wrong in suggesting the addra, in which the females are horned. Dr. Keller is likewise of opinion that they are gazelles, but identifies them with the Tibetan goa (*G. picticaudata*), a species with which the ancient Assyrians cannot, I conceive, have been acquainted. Such an identification is, moreover, perfectly unnecessary, seeing that in the goitred or Persian *Gazella subgutturosa* we have a practically local species which agrees in all respects—notably the hornless females—with the relief.

Having shown that the animals in this sculpture are of a local type, attention may be directed to Fig. 102, p. 301, which reproduces the figures on part of a cylinder brought by Sir H. Layard from Constantinople. One of the ruminants on this is identified by Dr. Keller with the Himalayan markhor (*Capra falconeri*), and the other with the Central Asian argali sheep (*Ovis ammon*). Both species, be it noted, are represented as being in captivity, under the charge of apparently Syrian attendants, and the female of the supposed markhor carries horns as long as those of the male, and has a kid. This renders it, I think, clear that both kinds were seen by the artist in the living condition, and if this be so, it is perfectly evident that they were not, respectively, markhor and argali; animals, the very existence of which could not, I submit, have been even known to the ancient Assyrians. It is no argument to state, as the author does on another page, that the Assyrians were in the habit of bringing two-humped Bactrian camels from Afghanistan, seeing that these animals now come as far south as the Crimea and the Caucasus. Moreover, the long horns of the female are fatal to the markhor theory. In my opinion there is every reason to regard the supposed markhor as Circassian domesticated goats, in which both sexes carry long spiral horns.

As to the supposed argali, I am less confident but unless they be domesticated sheep, it may be suggested that they are Pallas's tur (*Capra cylindricornis*), of the eastern Caucasus, and in any case there can be little or no hesitation in regarding them as representing a more or less strictly local species. In connection with sheep, it must suffice to mention that there is great doubt as to the identification of those in the Negadah plate, B.C. 6000–5000 (Fig. 106, p. 310), with the domesticated Hausa sheep of Nigeria, as they appear to represent the wild udad, or Barbary sheep (*Ovis lervia*, or *tragelaphus*), of North Africa generally.

[1] *Antilope damma* of the author.

In place, therefore, of foreign species, with which it seems impossible for the ancient Egyptians and Assyrians to have been acquainted, it seems to me that all the ruminants referred to by Dr. Keller are local forms, well known to the artists and sculptors by whom they were painted or chiselled. The same remark will, I believe, apply to the representations of the Indian elephant, like the one on the obelisk of Salmanassar II. (Fig. 130, p. 375), although the author regards these animals as of foreign origin. He appears, however, to be unacquainted with the definite record that at an early date the Assyrian kings hunted the Indian elephant in the Euphrates valley, this record being confirmed by the occurrence of fossilised remains of the so-called *Elephas armeniacus*, which may have been merely a local race of the former species, in Armenia.

The Indian elephant being thus shown to have been a local, instead of an imported, species in ancient Assyria, it may be suggested that if the unicorn animal on the obelisk of Salmanassar ii. be, as Dr. Keller suggests (p. 386, Fig. 133), the Indian *Rhinoceros unicornis*, which is known to have had formerly a much wider distribution than at the present day, that species may likewise have ranged in Assyrian times into Mesopotamia; and, if this be the case, it will be practically certain that all the animals represented by the artists of ancient Egypt and Assyria were more or less local species.

More criticism of much the same nature might be added, but sufficient has been stated to show that while the volume under review contains a very large amount of valuable information concerning the early history of well-known animals, at least the portion relating to ungulates stands in need of revision by a writer with a fuller knowledge of that group than the author appears to possess. R. L.

THE DESIGN OF REINFORCED CONCRETE STRUCTURE.

(1) *A Concise Treatise on Reinforced Concrete.* By C. F. Marsh. Pp. viii+225. (London: Constable and Co., Ltd., 1909.) Price 7*s.* 6*d.* net.

(2) *Concrete-Steel Construction.* By Prof. Emil Mörsch. Authorised translation from the third (1908) German edition, revised and enlarged by E. P. Goodrich. Pp. ix+368. (New York: The *Engineering News* Publishing Co.; London: Messrs. Constable and Co., Ltd., 1909.) Price 21*s.* net.

(3) *Il Cemento Armato e la sua applicazione practica.* By Cesare Presenti. Pp. 141. (Milan: Ulrico Hoepli, 1910.)

(4) *Le prove dei materiali da costruzione e le costruzioni in Cemento Armato.* By Giulio Revere. Pp. xii+541. (Milan: Ulrico Hoepli, 1910.) Price 11 lire.

THE employment of reinforced concrete in connection with engineering and architectural structures has now become so general that a text-book on somewhat simpler and more condensed lines than those of Mr. Marsh's well-known treatise on "Reinforced Concrete" will be gladly welcomed by many engineers and architects. The present volume (1) has been, to a certain extent, based upon a series of lectures delivered by the author in the winter of 1908–9 at the Central Technical College, London; hence, in all cases the derivation of important formulæ has been fully dealt with, but lengthy and detailed descriptions of the various systems of construction have been omitted; this latter portion of the subject was fully dealt with in the author's manual.

The first two chapters deal respectively with the properties and the behaviour under bending of reinforced concrete, the important question as to the value of the modulus of elasticity (E_c) for the concrete which should be adopted in the calculations required in connection with the design of struts and beams is very fully discussed, and Mr. Marsh shows that we may safely assume it to be 2,000,000 pounds per square inch when the concrete is two or three months old, or, in other words, that the ratio of E_s/E_c may be taken as 15. In the third chapter the various assumptions which have to be made for purposes of calculation are briefly explained, and their validity discussed; it is shown that, when calculations are based on the safe working stress for concrete, it is sufficiently accurate for all purposes to assume a straight line stress-strain relation for the concrete as well as for the steel.

The rest of the book is devoted to methods of calculation; after a short discussion of the bending moments of beams and slabs partially built in at the supports, direct compression is taken up, and then the longitudinal, bond, and shearing stresses in rectangular section and T section beams with single or double reinforcement; pipes and similar structures subjected to either internal or external pressure are then dealt with; a very thorough and complete investigation is next given of the calculations which are necessary in the design of small, and large, span arches, and other pieces which are subjected to both direct stresses and to bending stresses. The design of reinforced concrete arches is always admittedly a difficult piece of work, and there is no doubt that the treatment which Mr. Marsh gives of this branch of reinforced concrete work will prove of great service to those who only occasionally have to deal with such structures, as the methods explained and discussed are simple and direct.

In the last chapter a brief description is given of the general methods of reinforcement which should be adopted in structural work.

Mr. Marsh, by his well-known treatise, established his position as a trustworthy guide in this important field of engineering and architectural design, and the present volume is quite worthy of the reputation thus acquired.

(2) Prof. Mörsch, in his capacity as director of the technical bureau of the well-known firm of Wayss and Freytag, has been responsible for the design and erection of the reinforced structures built by this firm during the past fifteen years; he has, therefore, in